WHAT IS CLAIMED IS:

1. A packet transmission apparatus comprising a pre-processing unit configured so as to dynamically determine the priority of a packet belongs to a flow based on a specific policy,

wherein said pre-processing unit comprises:

a flow control information storage unit that correlates and holds information defining a flow of a packet and information concerning the priority of the packet belongs to the flow.

2. The packet transmission apparatus according to Claim 1,

wherein said pre-processing unit dynamically determines the priority of the packet belongs to the flow on the in order of arrival basis based on the transmission start time of the flow.

3. The packet transmission apparatus according to Claim 1,

wherein said pre-processing unit dynamically determines the priority of the packet belongs to the flow on the in reverse order of arrival basis based on the transmission start time of the flow.

4. The packet transmission apparatus according to Claim 1,

wherein said pre-processing unit dynamically determines the priority of the packet belongs to the flow using a random number.

5. The packet transmission apparatus according to Claim 1,

wherein said pre-processing unit dynamically determines the priority of the packet belongs to the flow based on the number of active flows at a transmission start point of the flow.

6. The packet transmission apparatus according to Claim 1,

wherein, when the transmission of the flow is continued, said pre-processing unit changes the priority of the packet belongs to the flow.

7. The packet transmission apparatus according to Claim 6,

wherein, when the transmission continuous time of the flow meets certain conditions, said pre-processing unit lowers the priority of the packet belongs to the flow.

8. The packet transmission apparatus according to Claim 6,

wherein, when the packet transmission amount meets certain conditions, said pre-processing unit lowers the priority of the packet belongs to the flow.

9. The packet transmission apparatus according to Claim 1,

further comprising an input unit for receiving user input,

wherein, when a user input is given from said input unit, said pre-processing unit changes the priority of a packet belongs to a present flow.

10. The packet transmission apparatus according to Claim 9,

wherein, when a user input is given from said input unit, said pre-processing unit fixes the priority of a packet belongs to a present flow.

11. The packet transmission apparatus according to Claim 10,

wherein, when a user input is given from said input unit, said pre-processing unit makes the priority of a packet belongs to a present flow higher than the present priority.

12. The packet transmission apparatus according to Claim 10,

wherein, when a user input is given from said input unit, said pre-processing

unit makes the priority of a packet belongs to a present flow lower than the present priority.

13. A packet transmission method that performs QoS guarantee, comprising:

in the case where a plurality of flows including packets having the same priority shares a guaranteed band,

handling these flows while making a difference between the priority of the packets belongs to at least one flow in these flows and the priority of the packets belong to the flows different from the one flow in these flows.

14. The packet transmission method according to Claim 13,

wherein the difference in the priority is made on the in order of arrival basis based on the transmission start time of the flows.

15. The packet transmission method according to Claim 13,

wherein the difference in the priority is made on the in reverse order of arrival basis based on the transmission start time of the flows.

16. The packet transmission method according to Claim 13,

wherein, when the sum of the bands of a plurality of flows including packets having the same priority exceeds the guaranteed band shared by these flows, these flows are handled on the in order of arrival basis based on the transmission start time of the flows so that a packet belongs to a flow having the earlier transmission start time is given with the priority higher than a packet belongs to a flow having the later transmission start time.

17. The packet transmission method according to Claim 13,

wherein, when the sum of the bands of a plurality of flows including packets

having the same priority exceeds the guaranteed band shared by these flows, these flows are handled on the in reverse order of arrival basis based on the transmission start time of the flows so that a packet belongs to a flow having the later transmission start time is given priority higher than a packet belongs to a flow having the earlier transmission start time.

18. The packet transmission method according to Claim 13,

wherein, when the sum of the bands of a plurality of flows including packets having the same priority exceeds the guaranteed band shared by these flows, a packet belongs to a flow having a later transmission start time is discarded earlier than a packet belongs to a flow having an earlier transmission start time on the in order of arrival basis based on the transmission start time.

19. The packet transmission method according to Claim 13,

wherein, when transmission of a flow starts, the priority of the flow is determined by using a random number.

20. The packet transmission method according to Claim 13,

wherein, the priority of a flow is determined based on the number of active flows at a point of transmission start of the flow.

21. A traffic conditioner, comprising:

a measurement priority setting unit operable to measure a token and to set the priority of a packet;

an MF classifier operable to input packets and to output packets having high priority to said measurement priority setting unit and outputs packets of low priority to the outside; and

a flow control unit operable to hold token parameters for each flow,

wherein said flow control unit inputs flow information of a packet from said MF classifier and outputs a token parameter corresponding to the flow information to said measurement priority setting unit;

wherein said measurement priority setting unit compares a token which is modified by a token parameter input from said flow control unit with the packet length of the packet, and sets the priority of the packet based on a comparison result.

22. The traffic conditioner according to Claim 21,

wherein said measurement priority setting unit is shared by a plurality of flows.

23. The traffic conditioner according to Claim 21,

wherein the token parameter is a token threshold which is subtracted from the token in modification by said measurement priority setting unit, and the flow information is the header information of the packet.

24. The traffic conditioner according to Claim 21,

wherein said flow control unit sets the token parameter so that a flow of which transmission has started earlier becomes advantageous on the in order of arrival basis based on the transmission start time of the flows.

25. The traffic conditioner according to Claim 21,

wherein said flow control unit sets the token parameter so that a flow of which transmission has started later becomes advantageous on the in reverse order of arrival basis based on the transmission start time of the flows.

26. The traffic conditioner according to Claim 21,

wherein said flow control unit changes the token parameter of a flow of which transmission has continued longer than a certain period of time so that the flow becomes disadvantageous.

27. The traffic conditioner according to Claim 21,

wherein said flow control unit changes the token parameter of a flow of which the accumulated used amount has exceeded a certain amount so that the flow becomes disadvantageous.

28. The traffic conditioner according to Claim 21,

wherein said flow control unit has a packet counter for each flow, resets the packet counter of a relevant flow to 0 when a packet has arrived, increases the packet counters of flows other than that flow by 1, and terminates the control of a flow of which the packet counter has exceeded a certain value.

29. A priority control mechanism, comprising:

a plurality of queues provided for each class of the priorities of packets;

a classifier operable to input the packets to classify the packets in accordance with the priorities

a queue control unit that inputs the packets classified by said classifier and, unless the discard conditions regarding the packets are met, inserts the packets into any of said plurality of queues; and

a flow control unit that holds the discard parameters for each flow,

wherein said flow control unit inputs flow information of the packets from said classifier and outputs a discard parameter corresponding to the flow information to said queue control unit,

wherein the discard conditions are determined based on a packet length of a packet, a queue length of a queue relevant to the packet, and a discard parameter of a flow relevant to the packet.

30. The priority control mechanism according to Claim 29,

wherein the discard conditions indicate that the packet is discarded, when the sum of the packet length of a packet and the queue length of the queue relevant to the packet is larger than the discard parameter.

31. The priority control mechanism according to Claim 29,

wherein said queue control unit is shared by a plurality of flows.

32. The priority control mechanism according to Claim 29,

wherein said flow control unit sets the discard parameter so that a flow of which transmission has started earlier becomes advantageous on the in order of arrival basis based on the transmission start time of the flows.

33. The priority control mechanism according to Claim 29,

wherein said flow control unit sets the discard parameter so that a flow of which transmission has started later becomes advantageous on the in reverse order of arrival basis based on the transmission start time of the flows.

34. The priority control mechanism according to Claim 29,

wherein said flow control unit changes the discard parameter of a flow of which transmission has continued longer than a certain period of time so that the flow becomes disadvantageous.

35. The priority control mechanism according to Claim 29,

wherein said flow control unit changes the discard parameter of a flow of

which the accumulated used amount has exceeded a certain amount so that the flow becomes disadvantageous.

36. The priority control mechanism according to Claim 29,

wherein said flow control unit has a packet counter for each flow, resets the packet counter of a relevant flow to 0 each time when a packet has arrived, increases the packet counters of flows other than that flow by 1, and terminates the control of a flow of which the packet counter has exceeded a certain value.

37. A packet shaper comprising:

a packet queue operable to accumulate packets,

wherein, when a plurality of flows, which are accumulated in said packet queue and includes packets with the same priority, exists, the flows are handled while a difference is given between the priority of a packet belongs to at least one flow in these flows and the priorities of the packets belong to the flows different from the one flow in these flows.

38. The packet shaper according to Claim 37,

wherein the difference in the priority is made based on the in order of arrival basis based on the transmission start time of the flows.

39. The packet shaper according to Claim 37,

wherein the difference in the priority is made based on the in reverse order of arrival basis based on the transmission start time of the flows.

40. The packet shaper according to Claim 37,

wherein the difference in the priority is made based on using a random number.

41. The packet shaper according to Claim 37,

wherein, when the sum of the bands of a plurality of flows including packets having the same priority exceeds the output rate of the packet shaper, these flows are handled on the in order of arrival basis based on the transmission start time of the flows so that the priority of a packet belongs to a flow having the earlier transmission start time is higher than the priority of a packet belongs to a flow having the later transmission start time.

42. The packet shaper according to Claim 37,

wherein, when the sum of the bands of a plurality of flows including packets having the same priority exceeds the output rate of the packet shaper, these flows are handled on the in order of arrival basis based on the transmission start time of the flows so that a packet belongs to a flow having the later transmission start time is discarded earlier than a packet belongs to a flow having the earlier transmission start time.

43. A packet shaper, comprising:

a packet queue operable to accumulate packets;

a rate setting control unit operable to output the packets from said packet queue;

a flow control unit operable to hold discard parameters, which is set for each flow; and

a queue control unit operable to refer to the discard parameters of said flow control unit and, unless the discard conditions relevant to a packet are met to insert the packet into said packet queue,

wherein the discard conditions are determined based on a packet length of the packet, a queue length of said packet queue and the discard parameter of the flow relevant to the packet.

44. The packet shaper according to Claim 43,

wherein the discard conditions indicate that the packet is discarded, when the sum of the packet length of the packet and the queue length of the queue relevant to the packet is larger than the discard parameter.

45. The packet shaper according to Claim 43,

wherein said packet shaper control unit is shared by a plurality of flows.

46. The packet shaper according to Claim 43,

wherein said flow control unit sets the discard parameter so that a flow of which transmission has started earlier becomes advantageous on the in order of arrival basis based on the transmission start time of the flows.

47. The packet shaper according to Claim 43,

wherein said flow control unit sets the discard parameter so that a flow of which transmission has started later becomes advantageous on the in reverse order of arrival basis based on the transmission start time of the flows.

48. The packet shaper according to Claim 43,

wherein said flow control unit sets the discard parameter by using a random number.

49. The packet shaper according to Claim 43,

wherein said flow control unit changes the discard parameter of a flow of which transmission has continued longer than a certain period of time so that the flow

becomes disadvantageous.

50. The packet shaper according to Claim 43,

wherein said flow control unit changes the discard parameter of a flow of which the accumulated used amount has exceeded a certain amount so that the flow becomes disadvantageous.

51. A packet transmission apparatus, comprising:

a plurality of I/O interfaces operable to input and to output packets;

a routing/switching processing unit operable to transfer packets from one I/O interface in said plurality of I/O interfaces to another I/O interface in said plurality of I/O interfaces; and

a packet shaper set forth in Claim 37 interposed between said routing/switching processing unit and said another I/O interface, which performs a shaping of packets output from said routing/switching processing unit and outputs the packets shaped by said packet shaper to said another I/O interface.

52. The packet transmission apparatus according to Claim 51, further comprising:

a rate measuring unit operable to measure a maximum output rate of said another I/O interface,

wherein said rate setting control unit of said packet shaper dynamically changes the rate based on the maximum output rate measured by said rate measuring unit.

53. The packet transmission apparatus according to Claim 51,

wherein said rate measuring unit performs transmission and reception of

packets with a packet transmission apparatus of a communication partner and measures a maximum rate between the packet transmission apparatus of the communication partner and itself.

54. A packet transmission apparatus, comprising:

a plurality of I/O interfaces operable to input and to output packets;

a routing/switching processing unit that transfers packets from one I/O interface in said plurality of I/O interfaces to another I/O interface in said plurality of I/O interfaces; and

a packet shaper set forth in Claim 43 interposed between the said routing/switching processing unit and said another I/O interface, which performs a shaping of packets output from said routing/switching processing unit and outputs packets shaped by said packet shaper to said another I/O interface.

55. The packet transmission apparatus according to Claim 54, further comprising:

a rate measuring unit operable to measure a maximum output rate of said another I/O interface,

wherein said rate setting control unit of said packet shaper dynamically changes the rate based on the maximum output rate measured by said rate measuring unit.

56. The packet transmission apparatus according to Claim 54,

wherein said rate measuring unit performs transmission and reception of packets with a packet transmission apparatus of a communication partner and measures

a maximum rate between the packet transmission apparatus of the communication partner and itself.

57. A packet transmission apparatus, comprising:

a packet receiving unit operable to receive packets from the outside;

a discard decision unit operable to decide whether or not to discard the received packets;

a queue into which the packets decided not to be discarded by said discard decision unit are inserted in order;

a packet transmission unit operable to transmit the packets output from said queue to the outside

a flow control information storage unit operable to correlate and to hold information defining a flow of a packet with information concerning the priority of the packet belongs to the flow;

a quality determination unit operable to dynamically determine the priority of a packet belongs to a flow in accordance with a specific policy; and

a mode decision unit operable to perform a static/dynamic decision, that is, whether to statically determine the information concerning the priority of the received packet as the information held by said flow control information storage unit, or to dynamically determine by said quality determination unit.

58. The packet transmission apparatus according to Claim 57,

wherein the information concerning the priority of a packet belongs to a flow of said flow control information storage unit is configured so as to be a basis for the

static/dynamic decision.

59. The packet transmission apparatus according to Claim 57,

wherein the information concerning the priority of a packet belongs to a flow of said flow control information storage unit indicates, when indicating to decide dynamically, an invalid priority.

60. The packet transmission apparatus according to Claim 57,

wherein said queue and said quality determination unit are made as a pair one-to-one with each other, and the number of said pairs is the number of policies required.

61. The packet transmission apparatus according to Claim 57,

wherein the priority is a threshold for available capacity of a relevant queue, said discard decision unit decides whether or not to discard the received packet based on the threshold for the relevant queue and the available capacity.

62. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit refers to the accumulated used amount of the relevant flows and dynamically determines the priority.

63. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit refers to the continuous time of the relevant flow and dynamically determines the priority.

64. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit dynamically determines the priority using a random number.

65. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit refers to the number of active flows and dynamically determines the priority.

66. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit dynamically determines the priority so that a flow of which transmission has started earlier becomes advantageous on the in order of arrival basis based on the transmission start time of the flows.

67. The packet transmission apparatus according to Claim 57,

wherein said quality determination unit dynamically determines the priority so that a flow of which transmission has started later becomes advantageous on the in reverse order of arrival basis based on the transmission start time of the flows.

68. A packet transmission method for handling the flows having a common policy as a set of service quality, comprising;

defining an algorithm suitable to a policy particular to the set of service quality;

dynamically determining the priority of the packets of the flows belongs to the set of service quality while reflecting the usage situation of the transmission resources in accordance with the defined algorithm ; and

transmitting the packets of the flows belong to the set of service qualities in accordance with the determined priority.

69. The packet transmission method according to Claim 68,

wherein a plurality of flows belong to a plurality of sets of service qualities having a different policy, respectively, flows through a common transmission path in a mixed manner, and are handled independently from each other based on the set of

service qualities.

70. The packet transmission method according to Claim 68,

wherein a set of service qualities shared by the used queues is handled as a set of shared resources.

71. The packet shaper according to Claim 43,

wherein said flow control unit determines the priority of the packet belongs to the flow based on the number of active flows at a transmission start point of the flow.

72. The packet shaper according to Claim 43,

further comprising an input unit for receiving user input,

wherein, when a user input is given from said input unit, said flow control unit changes the priority of a packet belongs to a present flow.

73. The packet shaper according to Claim 72,

wherein, when a user input is given from said input unit, said flow control unit fixes the priority of a packet belongs to a present flow.

74. The packet shaper according to Claim 73,

wherein, when a user input is given from said input unit, said flow control unit makes the priority of a packet belongs to a present flow higher than the present priority.

75. The packet shaper according to Claim 73,

wherein, when a user input is given from said input unit, said flow control unit makes the priority of a packet belongs to a present flow lower than the present priority.